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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
FETZNER, TIFFANY A	

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 12/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/535,241	TSUDA, MUNETAKA	
	Examiner	Art Unit	
	Tiffany A Fetzner	2859	

-- Th MAILING DATE of this communication appears on the cov r she t with the correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *14-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *14-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 September 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED First RCE ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 29th 2003 has been entered.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file. The certified English translation has been received.

Response to Arguments

3. Applicant's arguments filed 09/29/2003 have been fully considered but they are not persuasive. Applicant's arguments on pages 8 through 12 of the October 7th 2003 response do not amend the claims to address or overcome the concerns raised by the examiner in the final action.

A) On page 8 paragraph **A.** of the September 29th 2003 amendment response applicant responds to the examiner's position that the features argued previously are not claimed, by referring to the original disclosure. The applicant has misunderstood the examiner's position. The examiner notes that there are other features taught in the specification that are not claimed by applicant, but an examination on the merits is based upon the limitations actually claimed, in the claims of the application only. The

examiner is not allowed to read limitations which are not required (i.e. explicitly stated) by the claims, into the claims. Arguments that are not supported by the claims are not persuasive.

B) With respect to the argument that "By correcting non-uniformity of distribution of the static magnetic field within the inspection space, the uniformity of the static magnetic field is stably maintained within the inspection space" [See page 8 the last paragraph of the September 29th 2003 amendment response], the examiner notes that the claim does not set forth that "the static magnetic field is "stably maintained" within the inspection space". The feature of maintaining a stable static magnetic field is not an aspect of the claims.

C) With respect to the arguments on page 9, the examiner notes that there are no arguments presented only statements that say the arguments follow the paragraphs, without addressing the concerns raised by the examiner in the previous office action. [See paragraphs B through F of page 9 of the September 29th 2003 response.] In paragroh D applicant's position is that the applicant agrees with the examiner that an iron yoke is not a static magnetic field generating means, but the acknowledgement of a fact does not address or clarify why applicant believes the presented claims to be novel and nonobvious. Therefore the examiner's concerns still remain.

D) Applicant also argues that the amendments to the claims address the examiner's concerns, but the examiner disagrees, the amendments remove intended use language and clarify that it is the static magnetic field non-uniformities (i.e. variations, fluctuations, inhomogeneities, and intensity changes) in magnetic field strength that applicant is

correcting by monitoring the temperature of the static magnetic field, and/or the indefinite term "surroundings", however because variations, fluctuations, inhomogeneities, and intensity changes are all non-uniformities in a static magnetic field, corrected in the prior art by monitoring the temperature and controlling the temperature caused fluctuations, by controlling the current which applies an additional canceling magnetic field, the difference between what applicant is claiming and what is already taught, shown, and suggested by the prior art, is not clearly set forth in the present claims.

E) With respect to the argument that neither **Yamaguchi et al.,** nor **Warner** teach or suggest non-uniformity (i.e. flucuations, distortions, variations in magnetic field strength, intensity, and homogeneity) of the static magnetic field caused by a temperature change, or a way to correct this non-uniformity (i.e, fluctuation) of distribution of the static magnetic field within the inspection space" [See page 10 the second paragraph through page 12 the second paragraph of the September 29th 2003 amendment response], the examiner disagrees. The fact that temperature causes distortions (i.e. non-uniformities, fluctuations, variations in magnetic field strength, intensity, and homogeneity) is a main teaching of both references, and both teach a means to correct these variations by controlling the current which flows through the coil components. [See the entire disclosure and figures of both references].

F) Applicant fails to recognize that the terms fluctuations, distortions, non-uniformities, or variations in magnetic field strength, intensity, and homogeneity, as concerns a static magnetic field are functionally equivalent terms, and are interpreted by

the examiner as meaning the same thing, because the prior art and the applicant are both addressing the exact same problem with synonymous terms. **Yamaguchi et al.,** and **Warner** lack the term "non uniform" but a fluctuation or a distortion of a static magnetic field is a non uniformity because a static magnetic field is no longer constant. Therefore, the limitation is still met by the prior art.

G) With respect to the argument that the combination of **Yamaguchi et al.,** with **Warner** would change the principle of operation of **Yamaguchi et al**., reference, [See page 12 the last paragraph of the September 29th 2003 amendment response], the examiner disagrees because if the electromagnetic apparatus of **Warner** figure 2 were substituted for the component identified as component 1 in **Yamaguchi et al**., the modified device would still detect and correct for fluctuations (i.e. static magnetic field distribution non-uniformities) as taught by **Yamaguchi et al**., and **Warner.**

H) On page 3 paragraph 3, of the arguments filed in the April 22nd 2003 response applicant argues that the shim coil consists of one or a plurality of coils that "include a coil that generates a magnetic field of the z^2 term and a coil that generates a z^4 term ..." However this feature is not set fourth and claimed in applicant's independent claims, it applies only to a dependent claim, which has already been rejected with this feature addressed. Therefore, the examiner is not persuaded by this argument.

I) The applicant's arguments on page 4 paragraph 1, of the arguments filed in the April 22nd 2003 response are not persuasive because "correcting the sum of the non-uniformity of the magnetic field" is not claimed. Additionally, this argument has 112

problems because the type of magnetic field being corrected (i.e. static, gradient, shim, etc.,) is not specified.

J) On pages 4 paragraph 2 through page 6 paragraph 4, of the April 22nd 2003 response applicant presents an argument to distinguish the instant application, over the applied prior art, however this argument is not persuasive because applicant is attempting to argue the difference between magnetic field intensity correction versus non-uniformity correction, however conventionally the uniform intensity is used to describe the magnetic field of an NMR / MRI device, and by correcting the magnetic fields of the device to make the fields more uniform with a higher intensity, the prior art corrects the non-uniformities present. Therefore the intensity correction methods of the prior art does suggest magnetic field non-uniformity correction as well, and the applicant's presented argument is non-persuasive.

4. Applicant is invited to request a joint telephone interview with the examiner, and applicant's representative since the novelty of applicant's invention, as claimed is still not distinguishable from the prior art of record, and applicant's arguments, suggest to the examiner that there are limitations of novelty absent from the claims.

Drawings

5. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims.

Figures 1 and 7 do not show all of the apparatus features as set forth in the independent apparatus claims.

A) In figures 1 and 7 the "control unit" that controls the magnetic field correcting unit (i.e. shim coil component 15) is not shown. A shim "power source" 14 is shown but a shim "power source" represents a power source only, not a controlling unit as well. If applicant's "shim power source" 14 is both a power source and a shim correction means component 14 should be relabeled in both figures 1 and 7 to show this. Therefore, the "control unit" that controls the magnetic field correcting unit must be shown in the figures or the feature(s) canceled from the claim(s). No new matter should be entered.

B) In figures 1 and 7 the arrows connected to thermometer components 13, 13a, and 13b show that input is supplied to shim power source 14 only, (i.e. the temperature information is supplied to a power source (i.e. a shim battery), not as applicant claims the means for controlling the shim coils. The examiner notes that the shim coils are component 15.

C) Components 13, 13a and 13b in Figures 1 and 7 also need to be identified by a "thermometer" label as blank boxes that are not labeled are improper in patent figures, and what components 13, 13a, and 13b represent from the figure itself is unclear without a label. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim objections

6. **Amended Claims 14, 21-23,** and **30-31** are objected to because of the following informalities: the amended limitation of non-uniformity of distribution of is grammatically awkward replacing of distribution of with of **the** distribution of is a way in which the

awkwardness is correctable in all places where this mistake is made. Appropriate correction is required.

35 U.S.C. 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. **claims 14-31** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. The term " temperature of the static magnetic field generating unit **and/or surroundings** " in **claims 14-31** is a relative term which renders the claim indefinite. The term " **and/or surroundings** " is not defined by the claim, and the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

10. Specifically the boundaries and scope of the word "surroundings" is vague and indefinite. Surroundings could be the area immediately within the bore of the NMR apparatus, the bore and the components around the bore, the temperature of the bore, the temperature of any NMR component that is not the static magnetic field generating means, a combination of NMR components, or everything in an NMR imaging location. Correction is needed.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13. **Claims 14-31** rejected under **35 U.S.C. 103(a)** as being unpatentable over **Yamaguchi et al.,** US patent 4,663,592 issued May 5th 1987 in view of **Warner** UK patent GB 2 219 406 A Published 6 December 1989 from the November 19th 2002

14. With respect to **Amended Claim 14, Yamaguchi et al.,** teaches and shows a magnetic resonance imaging apparatus comprising: a static magnetic field generating unit" (i.e. a magnetic coils 1) that generates a homogeneous (i.e. a uniformly distributed) static magnetic field in an inspection space" [See col. 1 lines 13-28, col. 1 line 64 through col. 2 col. 2 line 21, col. 4 line 29 through col. 5 line 50, Figures 1 and 5] The examiner notes that a static magnetic field by definition has a substantially constant (i.e. static) magnetic intensity that intrinsically and necessarily has a distribution in three-dimensional space. **Yamaguchi et al.,** also teaches and shows "a high-frequency magnetic field generating unit; [See Figure 5 RF oscillator component 35] Yamaguchi et al., additionally teaches, suggests and shows "a detecting unit" (i.e. the RF receiver coil taught in col. 2 lines 15-21) "that detects magnetic resonance signals generated from an

object to be examined"[See Figures 1 through 5, col. 2 lines 15-21]. **Yamaguchi et al.,** teaches, suggests and shows "a display unit that displays a result of the detection", [See Figure 5, col. 4 lines 29-62] "wherein the magnetic resonance imaging apparatus further comprises: a magnetic field correcting unit" (i.e. the adder/subtractor A/S circuit 17 of Figure 1, along with current sources 19, 20, and the magnetic coils 1,) "that generates an additional magnetic field for making uniform a space distribution of the static magnetic field;" [See Figures 1, 5, col. 2 lines 33-41, col. 2 line 42 through col. 3 line 39. Specifically, the teaching of col. 3 lines 33-39 suggests that 'when variations in the static magnetic field Ho occur due to temperature variation, that the above described embodiment, (i.e. the **Yamaguchi et al.,** invention) will react and cause **magnetic fields to be applied**, at a constant intensity, by controlling the value of the current supplied to the magnetic coils 1, to suppress any fluctuations in the magnetic field H_0. [See col. 3 lines 21-39].

15. The examiner's position is that the teaching of suppressing "any fluctuations in the magnetic field H_0" is interpreted as a teaching of suppressing "non-uniformities in the spatial distribution of the static magnetic field"; "variations in magnetic field intensity"; "areas of inhomogeneities within the spatial distribution of the static magnetic field"; or "variations in the uniformity of the static magnetic field", because each of these terms are the intrinsic types of fluctuations that cause a static magnetic field (i.e. the magnetic field identified as H_0 by **Yamaguchi et al.,)** to occur. These types of fluctuations are also functionally equivalent to one another, because when a change in intensity, uniformity or homogeneity occurs a static magnetic field is no longer static,

(i.e. constant, fixed, unchanging).. The teaching of col. 3 lines 21-39, directly states in paraphrased form that when the temperature sensors of **Yamaguchi et al.,** detect a fluctuation in the magnetic field H_0 because of a change in temperature the inventive embodiment (i.e. the inventive embodiment of **Yamaguchi et al.,**) reacts to cause magnetic fields to be applied (i.e. additional magnetic fields are applied to the static magnetic field already being generated) at constant intensity to suppress (i.e. cancel, reduce, minimize, eliminate) any fluctuations in the magnetic field H_0. The examiner notes that the applied magnetic fields which are applied to counteract the detected change are controlled by controlling the value of the current supplied to the magnetic coils.

16. The ability to generate an additional controlling magnetic field, as a result to a change in temperature detected by a temperature sensor to keep the static magnetic field constant is also taught by **Warner**. [See Warner page 5 lines 5-13, page 5 line 33 through page 6 line 10; page 6 line 35 through page 7 line 23; and claims 13, 15, 17 and 18 on pages 10 and 11 of the Warner reference.]

17. Additionally, **Yamaguchi et al.,** teaches, suggests and shows "a temperature detecting unit that detects a temperature of the static magnetic field generating unit and/or surroundings thereof;" [See col. 3 lines 21-39, Figure 1] "a control unit" (i.e. the adder/subtractor A/S circuit 17 of Figure 1) "that controls the magnetic field correcting unit;" (i.e. the adder/subtractor A/S circuit 17 of Figure 1, along with current sources 19, 20, and the magnetic coils 1,) "based on the temperature detected by the temperature-detecting unit." [See Figures 1, 5, col. 2 lines 33-41, col. 2 line 42 through col. 5 line 50.]

18. **Yamaguchi et al.**, lacks teaching that the main magnet of a magnetic resonance imaging device also includes at least one gradient field coil/unit that generates a magnetic field strength gradient;" explicitly, however, it is well established that magnetic resonance systems inherently have at least "one gradient field coil for generating a gradient magnetic field", because, in an MRI system there are intentionally applied time varying magnetic fields, (i.e. magnetic field gradients) which are well known and conventionally applied in one or more of the x, y, and z axis directions. The magnetic field gradients are produced conventionally by gradient coils, which are necessary to impose the magnetic fields which encode the phase, frequency, and / or slice, of the RF excitation pulses applied to the main, static, and substantially homogeneous and uniform B0 magnetic field. In general, it is well known that the interaction of the excitation pulse, the static magnetic field, and the magnetic field gradients allow the magnetic resonance phenomenon to form an output image as a result of computer processing. Without the presence of the inherent magnetic gradients, which are conventionally applied on axes which are orthogonal to each other, and implicitly the means to produce them, (i.e. at least one gradient coil), a magnetic resonance image (i.e. a two or three dimensional image of the detected nucleic spin precession) of the subject would not result, and the **Yamaguchi et al.,** reference does produce NMR images. [See col. 1 lines 38-39; col. 1 lines 41-50; col. 4 lines 45-51 and figure 4 display component 40 on which the NMR image is displayed.] Therefore, the examiner considers in inherent that the **Yamaguchi et al.,** reference has "at least one gradient

coil for generating a gradient magnetic field" because without a gradient field to encode the position information of the signal an image of the patients anatomy would not result.

19. Additionally, **Warner** suggests the presence of "at least one gradient coil for generating a gradient magnetic field". [See page 2 lines 13-28 where the ferromagnetic means is interpreted by the examiner as a main magnetic field means, and where the windings which cooperate with the ferromagnetic means, are broadly interpreted by the examiner as being representative of a gradient coil that may be arranged around the x, y, and z axes] **Warner** also teaches that the control means may control or maintain current in at least one said winding (i.e. a gradient coil) irrespective of at least one change in temperature, [See page 4 lines 24-30].

20. It would have been obvious to one of ordinary skill in the art at the time that the invention was made that in situations where multiple disjoint sample regions of a patients' anatomy are to be sampled by NMR, with gradients applied for each of the disjoint sample areas that the **Yamaguchi et al.,** reference can be modified to include a gradient means in direct combination with the static magnetic field for each sample area, by substituting the **Warner** electromagnet apparatus of figure 2, which includes static ferromagnetic means 3 and 4 for one or more of the magnetic coils depicted as component 1 in **Yamaguchi et al.,** figure 1 because like **Yamaguchi et al.,** the electromagnet apparatus of **Warner** figure 2, has temperature sensors 26 and 27 (i.e. as opposed to **Yamaguchi et al.,** 's temperature sensors 11 through 16) attached to the static ferromagnetic means 3 and 4; (i.e. as opposed to **Yamaguchi et al.,** 's magnetic field components 11 through 16, identified as component 1) and also includes a

gradient means (i.e. coils 1 and 2 of **Warner**) which contains a plurality of windings, for applying additional magnetic fields in specific directions in direct combination with the static magnetic field. Therefore, the substitution of the **Warner** electromagnet for the **Yamaguchi et al.,** 's magnetic field components identified as component 1, would not change the functionality of the **Yamaguchi et al.,** reference as claimed, while also providing multiple sample spaces with each one having a gradient coil means. Additionally because both apparatuses are specifically directed toward controlling the intensity of the static magnetic fields in an MRI system and effectively compensating for temperature changes, that can occur in an MRI system, it would have been obvious to one of ordinary skill in the art at the time that the invention was made that substituting the **Warner** electromagnet for component 1 in the **Yamaguchi et al.,** reference would improve the resolution of the images detected with the **Yamaguchi et al.,** reference because more than at least one gradient means would be present.

21. With respect to **Amended Claim 23**, this claim is another version of **Amended claim 14**, with a few additional limitations, for the purpose of brevity only the rejections for the additional limitations are given below. **Yamaguchi et al**., teaches, suggests and shows "said static magnetic field generating unit comprising" at least "a pair of superconducting coils and a pair of cryostats each accommodating one of said pair of superconducting coils;" [See Figure 1] a supporting means (i.e. frame component 3) that supports said pair of cryostats as being apart so as to form an inspection space for an object to be examined" [See Figure 1] The same reasons for rejection, obviousness,

and motivation to combine that apply to **claims 14, 17, 21** also apply to **claim 23** and need not be reiterated.

22. With respect to **Amended Claim 30**, this claim is another version of **Amended claim 23**, with an additional limitation of "correcting non-uniformity of distribution of said static magnetic field within said inspection space being caused by deformation of said supporting means due to the temperature change of said static magnetic field generating unit and/or surrounding space of it;" of **Yamaguchi et al.,** teaches, suggests and shows this limitation. [See the abstract, col. 1 line 64 through col. 2 line 32, col. 3 line 21 through col. 3 line 54] The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 14, 17, 21, 23** also apply to **claim 30** and need not be reiterated.

23. With respect to **Claim 15** and **corresponding claim 24** which depend from **Amended claims 14** and **23** respectively, **Yamaguchi et al.**, teaches and suggests "the control unit has a temperature setting unit that sets a temperature detected by the temperature-detecting unit." [See col. L line 64 through col. 5 line 50, Figures 1 through 5.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **Amended claims 14, 23** also apply to **claims 15,** and **24** and need not be reiterated.

24. With respect to **Claim 16** and corresponding **claim 25** which depend from **Amended claims 14** and **23** respectively, **Yamaguchi et al.,** teaches and suggests that "the temperature detecting unit detects temperatures of at least two positions." [See col. 2 lines 26-30, col. 1 line 64 through col. 5 line 50 in general.] The same reasons for

rejection, obviousness, and motivation to combine, that apply to **Amended claims 14, 23** also apply to **claims 16,** and **25** and need not be reiterated.

25. With respect to **Claim 17,** and **corresponding claim 26** which depend from **Amended claims 14** and **23** respectively, **Yamaguchi et al.,** lacks teaching directly that "the magnetic field correcting unit comprises a shim coil for generating an additional magnetic field and a shim power source that supplies a current to the shim coil, however **Yamaguchi et al.,** teaches that the temperature distortions are corrected by taking the temperatures of various parts, and taking various coefficients and reference voltages, and then adjusting the current source, (i.e. power source) to produce a constant magnetic field intensity of the subject, or adjusting the RF current applied to an RF coil, or mathematically adjusting the results. [See col. 5 lines 23-33] The ability to take the temperatures of various parts, and taking various coefficients and reference voltages, and then adjusting the current source, (i.e. power source) to produce a constant magnetic field intensity of the subject, suggests, that an additional correctional magnetic field may be implied on the main static field to maintain the static field at a constant value.

26. The **Yamaguchi et al.**, reference lacks a direct teaching on this point, however the teachings of **Warner** do teach and suggest that "at least one temperature sensor is used to detect a temperature change in at least a portion of the static magnetic field ferromagnetic means, and that feedback circuitry then changes at least one magnetic control winding (i.e. the examiner considers the control windings of **Warner** to be effectively a magnetic shim coil) to provide at least one controlling magnetic field." [See

Warner page 5 lines 5-13] The examiner considers the "controlling magnetic field" to be applicant's "additional magnetic field". Additionally, **Warner** teaches that the control winding(s) may be energized by any suitable power supply, [See page 5 lines 33-34] therefore the teachings of **Warner** also suggest "a shim power source that supplies a current to the shim coil", because there is a power source that is providing power to the control coil winding, (i.e. the shim coil). The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 14, 23** also apply to claims **17** and **26** and need not be reiterated.

27. With respect to **Claim 18,** and corresponding **claim 27** which depend from claims 14 and 23 respectively, **Yamaguchi et al.**, teaches and / or suggests that "the control unit (i.e. the adder/subtractor A/S circuit 17 of Figure 1) comprises a voltage generating unit that generates a voltage corresponding to a non uniformity component of the magnetic field at the temperature detected by the temperature detecting unit, a voltage/current converter that converts the voltage output by the voltage generating unit to current, and a supplying unit that supplies to the magnetic field correcting unit the current generated from the voltage/current converter." [See col. 1 line 64 through col. 5 line 50] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 14, 23** also apply to claims **18, 27**.

28. With respect to **Claim 20,** and corresponding **claim 29** which depend from claims 14 and 23 respectively, **Yamaguchi et al.**, shows and suggests that "the temperature detecting unit is disposed near the static magnetic field generating unit and/or in a room where the static magnetic field generating unit is placed." [See Figures 1 through 5,

which suggests that all of the components are in close proximity to one another, or in a single defined area, (i.e. a room).] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 14, 23** also apply to **claims 20, 29**.

29. With respect to Amended **Claim 21**, and which depends from **claim 14**, **Yamaguchi et al.,** teaches and suggests "A method of maintaining a static magnetic field generated by a static magnetic field generating unit uniform in a magnetic resonance imaging apparatus, by generating an additional magnetic field, [See col. 3 lines 20-39] the method comprising the steps of: calculating a temperature dependence of a non-uniformity of distribution of the static magnetic field in an inspection space for an object to be examined, said non-uniformity distribution of the static magnetic field being caused by temperature change of the static magnetic field (i.e. H0) generating unit and/or surroundings thereof" [See col. 1 line 6 through col. 5 line 50, specifically col. 2 line 52 through col. 3 line 14] **Yamaguchi et al.,** also teaches and suggests "detecting a temperature of the static magnetic field generating unit; and/or surroundings thereof" [See col. 3 lines 21-61] "and calculating/generating the additional magnetic field having a magnetic field distribution that corrects said nonuniformity of distribution of the static magnetic field within said inspection space based on the detected temperature. " [See col. 2 line 62 through col. 5 line 43, especially col. 3 lines 21-39] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 14, 17** also apply to **claims 21**.

30. With respect to **Claim 19,** and **corresponding claim 28** which depend from **claims 14** and **23** respectively, **Yamaguchi et al.,** lacks teaching that "the magnetic

field correcting unit generates at least one additional magnetic field of linear term of y, quadratic term of z and quartic term of z, where z is the direction of the static magnetic field and y is one direction orthogonal to z." however, the controlling winding of **Warner**, which provides at least one controlling magnetic field, illustrated in Figures 1 and 2 suggests this limitation. [See Figure 1, where the x and y direction are orthogonal to the z-axis; and page. 5 lines 5-13; page 6 line 19 through page 7 line 23]. The examiner also notes that within the MRI / NMR art the direction of the static magnetic field is conventionally designated to be z, while the two remaining orthogonal directions are conventionally designated x and y; with x being the primary orthogonal plane in horizontal configurations, and y the primary orthogonal plane in vertical magnet, or open magnet situations. Given the orientation of the magnet in Figure 2, the interpretation that the direction of the magnetic field produced by correction coils 166, as "y" is conventional, inherent, and proper. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 14, 17, 21, 23,** also apply to **claims 19, 28.**

31. With respect to **Amended Claim 22**, **Yamaguchi et al.**, teaches, suggests and shows "A magnetic resonance imaging apparatus comprising: a static magnetic field generating means that generates a homogeneous static magnetic field in an inspection space; [See Figure 1] "and an uniformity correcting means that detects temperature change affecting the uniformity of distribution of the static magnetic field generated by the static magnetic field generating means" [See Figure 1, temperature detection sensors 11-15, 16, and add/subtractor circuit 17] " that generates an additional static magnetic field that cancels non-uniformity of distribution of the static magnetic field

within said inspection space based on the detected temperature change." [See abstract, col. 1 line 41 through col. 5 line 50] Additionally Warner teaches these limitations. [See Figures 1 through 3; page 1 line 2 through page 11 line 30] The examiner notes that specifics concerning these limitations have already been given earlier in this rejection, that need not be reiterated again. The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 14, 17, 21** also apply to **claim 22**.

32. With respect to **Amended Claim 31**, which in alternative only form depends from any one of **claims 14, 23** or **30**; **Yamaguchi et al.**, teaches, suggests and shows a "means that calculates a temperature dependence of non-uniformity of distribution of the static magnetic field in the inspection space, said nonuniformity distribution of the static magnetic field being caused by temperature change of the static magnetic field generating unit and/or surroundings thereof; means that holds a control data for correcting the non-uniformity of distribution of the static magnetic filed corresponding to the temperature; and means that outputs the control data being selected from said control data holding means based on the detected temperature into said control unit. [See Figures 1 through 5; abstract, col. 1 line 64 through col. 5 line 50.] Additionally **Warner** teaches these limitations. [See Figures 1 through 3; page 1 line 2 through page 11 line 30] The examiner notes that specifics concerning these limitations have already been given earlier in this rejection that need not be reiterated again. The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 14, 17, 21, 23** also apply to **claim 31** and need not be reiterated.

Prior Art of Record

33. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) **Ishihara et al.,** US patent 6,194,899 B1 issued February 27th 2001; filed February 17th 1999.

B) **Ishihara et al.,** US patent 5,378,987 issued January third 1995; filed March 11th 1993;

C) **Watkins et al.,** US patent 6,252,405 B1 issued June 26th 2001 filed November 15th 1999; This reference is not prior art due to applicant's certified English priority translation.

Conclusion

34. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: **until January 27th 2003** (703) 305-0430. After **January 27th 2003** (571) 272-2241 The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

35. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached on (703) 308-3875: **until February 10th 2003** After **February 10th 2003** (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.

36. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0956.

Diego Gutierrez

TAF

Supervisory Patent Examiner

December 12, 2003

Technology Center 2800